2. The laser of claim 1, wherein said optical gain medium is any one selected from the group consisting of a rare earth ion doped single mode optical fiber, a rare earth ion doped single mode planar waveguide, a titanium doped sapphire crystal and a Nd-YVO_4 crystal.

3. The laser of claim 1, wherein said optical gain medium is a semiconductor amplifier.

4. The laser of claim 3, wherein the optical pump means generates a current whose intensity modulation frequency is equal to the intermode spacing of longitudinal resonator modes or some integral multiple of the spacing, which results the gain constant modulation of said semiconductor amplifier, thereby the laser source generates mode-locked optical pulses and its pulse generation timing is appropriately adjusted.

5. The laser of claim 1, wherein said wavelength tunable filter is any one selected from the group consisting of an acousto-optic wavelength tunable filter, a Fabry-Perot interferometric wavelength tunable filter and a reflective diffraction grating with varying reflective center wavelength depending upon the rotation of the grating.

6. The laser of claim 1, wherein said wavelength tunable filter comprises:

a beam deflection means for controlling the direction of propagating light; and

an optical device capable of producing low optical loss only within determined frequency range when the light transmitted or reflected depending on the controlled beam direction is coupled to the resonator.

7. The laser of claim 6, wherein said beam deflection means is an acousto-optic modulator that controls the beam direction according to the frequency of the acoustic wave.

8. The laser of claim 6, wherein said beam deflection means is a multiple phased array that controls the beam direction according to the phase differences of the respective light beams when light beams divided into several optical paths recombine together

9. The laser of claim 1, wherein said non-linear medium includes a length of single mode optical fiber.

10. The laser of claim 1, wherein said non-linear medium includes semiconductor to enhance self-phase modulation effect and to act as a saturable absorber, thereby said non-linear medium helps the generation of mode-locked optical pulses.

11. The laser of claim 1, wherein said gain medium is comprised of one optical device that also acts as a non-linear medium.

12. The laser of claim 11, wherein said gain medium is a rare earth ion doped optical fiber with much non-linear refractive index change or a titanium doped sapphire crystal.

13. The laser of claim 1, further comprising within said resonator:

an optical amplitude modulator for helping the generation of mode-locking as well as for adjusting the optical pulse generation timing; and

a modulation signal generator for supplying alternating electrical signal to said optical amplitude modulator, the frequency of the electrical signal being equal to the intermode spacing of longitudinal resonator modes or some integral multiple of the spacing.

14. The laser of claim 1, further comprising within said resonator:

an optical phase modulator for helping the generation of mode-locking as well as for adjusting the optical pulse generation timing; and

a modulation signal generator for supplying alternating electrical signal to said optical phase modulator, the frequency of the electrical signal being equal to the intermode spacing of longitudinal resonator modes or some integral multiple of the spacing.

15. A method of mode-locked laser pulse generation, comprising the steps of:

preparing within a resonator a wavelength tunable filter and a non-linear medium with light intensity dependent refractive index;

transmitting optical pulses in said non-linear medium to broaden the spectrum of the optical pulses by inducing self-phase modulation;

tuning said wavelength tunable filter so that the minimum loss wavelength range of the tunable filter can continuously vary with time; and

amplifying only selected portions of the broadened optical pulses, the wavelength spectrum of the selected portions being placed around the minimum loss wavelength range.

16. The method of claim 15, wherein tuning the wavelength tunable filter so that V is higher than $V_c(=\ln(r)\Delta^4/b^2)$ for most of wavelength sweeping time, thereby a plurality of resonator modes can simultaneously oscillate, where V is the variation speed of the minimum loss center wavelength, Δ is the wavelength spacing between resonator modes, b is the full width at half maximum, ln(r) is the natural logarithm of the ratio r of the maximum to the minimum light intensity for each mode.

17. The method of claim 15, wherein applying electrical signal to said wavelength tunable filter, the frequency and/or voltage of the electrical signal continuously and periodically sweeping over a predetermined range.

18. The method of claim 17, wherein superimposing a short electrical pulse over the front portion of each repeating waveform of the electrical signal, thereby tuning pulse generation timing to the electrical pulse as well as helping the generation of optical pulses.

19. A laser, comprising:

a resonator having an optical path including therein an optical gain medium capable of amplifying light over specific wavelength band, a wavelength tunable filter with minimum loss center frequency range, and a frequency shifter shifting the frequency of the light;

an optical pump means for the population inversion of said optical gain medium;

a filter modulation signal generating means for continuously varying the minimum loss center frequency range of said wavelength tunable filter with time; and

means for suppressing the generation of optical pulses by adjusting the frequency shift in said frequency shifter substantially equal to the center frequency change in said wavelength tunable filter for one resonator round trip time;

wherein the laser output is continuous wave type and its center frequency varies continuously with time.

20. The laser of claim 19, wherein said frequency shifter is an acousto-optic frequency shifter operating by an alternating electrical signal with a fixed frequency, the acoustic wave generated by the electrical signal giving the refraction and Doppler shift effect to the light.

21. The laser of claim 19, wherein said frequency shifter and wavelength tunable filter are comprised of only one acousto-optic wavelength tunable filter, the frequency change in the electrical signal applied to said acousto-optic filter to change the center frequency of said acousto-optic filter is small with respect to time, the direction of frequency shift is the same with that of the filter center frequency change, and the frequency shift for a resonator round trip is substantially equal to the frequency change in the filter center frequency.

22. A method of laser light generation, comprising the steps of:

preparing a resonator having an optical path including therein a wavelength tunable filter with minimum loss center frequency range, and a frequency shifter;

producing a fixed amount f_{FS} of frequency shift for the light passing through the optical path by said frequency shifter;

producing continuous change f_{FI} in the center frequency of said wavelength tunable filter for a resonator round trip time; and

tuning said wavelength tunable filter so that f_{FS} and f_{FI} have a substantially same value, and the laser output spectrum within said resonator oscillates around the center frequency of said wavelength tunable filter;

thereby the generation of optical pulses is suppressed and the laser radiates continuous wave.